FIG. 2

OBTAIN OR CREATE ORIGINAL DIGITAL SIGNAL OR IMAGE

ESTIMATE ROUGH OFFSET AND RMS NOISE

CHOOSE N OR N-BIT IDENTIFICATION WORD, E.G. 32

GENERATE N-BIT IDENTIFICATION WORD

GENERATE OR SYNTHESIZE N "RANDOM" INDEPENDENT SIGNALS WITH ROUGHLY GAUSSIAN DISTRIBUTION ABOUT SOME MEAN VALUE, WHERE SIGNALS HAVE EQUAL EXTENT AND DIGITAL SPACING OF ORIGINAL DIGITAL SIGNAL OR IMAGE

APPLY DIGITAL FILTER WHICH ATTENUATES
BOTH LOW AND HIGH FREQUENCIES, LEAVING
MIDDLE-RANGE FREQUENCIES LARGELY INTACT

CONDENSE N RANDOM SIGNALS TO A LOWEST ACCEPTABLE BIT VALUE IF MEMORY OR STORAGE SPACE IS AT A PREMIUM

ADD ALL RANDOM IMAGES TOGETHER WHICH HAVE A CORRESPONDING '1' IN THEIR ASSOCIATED BIT-PLACE-VALUE OF THE N-BIT IDENTIFICATION WORD, CALL THIS THE BASE COMPOSITE SIGNAL OR IMAGE

EXPERIMENT VISUALLY WITH GAIN AND GAMMA APPLIED.
TO BASE COMPOSITE SIGNAL OR IMAGE, ADDING THIS TO
ORIGINAL DIGITAL SIGNAL OR IMAGE, AND DETERMINING
THE ACCEPTABLE PERCEIVED NOISE LEVEL

APPLY FOUND GAIN AND GAMMA TO BASE COMPOSITE, ADD TO ORIGINAL, THEN CALL THIS THE DISTRIBUTABLE SIGNAL OR IMAGE

STORE AWAY AND SECURE ORIGINAL SIGNAL OR IMAGE, ALONG WITH N-BIT IDENTIFICATION WORD AND THEN RANDOM SIGNALS

SELL OR DISTRIBUTE THE DISTRIBUTABLE SIGNAL OR IMAGE

FIG. 3

OBTAIN DIGITAL OR NON-DIGITAL COPY
OF SUSPECT SIGNAL OR IMAGE

DIGITIZE IF NOT ALREADY DIGITAL

CUT AND MASK PORTION OF SIGNAL OR IMAGE BELIEVED TO BE SUSPECT (ONLY IF ENTIRE SIGNAL OR IMAGE IS NOT SUSPECT)

PROCURE ORIGINAL DIGITAL SIGNAL OR IMAGE AND CUT AND MASK TO ROUGHLY THE SAME LOCATION OR SEQUENCE

VISUALLY RESCALE AND REGISTER THE CUT-OUT SUSPECT SIGNAL TO THE CUT-OUT ORIGINAL SIGNAL

RUN THROUGH SEARCH PROGRAM WITH MEAN SQUARED ERROR AS CRITERIA AND X OFFSET, Y OFFSET, AND SCALE AS THE THREE VARIABLES

APPLY X OFFSET, Y OFFSET, AND SCALE TO CUT-OUT SUSPECT, THEN RESAMPLE ONTO EXACT GRID AND CUT-OUT OF ORIGINAL SIGNAL

RUN THROUGH SEARCH PROGRAM WITH MEAN SQUARED ERROR AS CRITERIA AND DC OFFSET, GAIN, AND GAMMA AS THE THREE VARIABLES; APPLY TO SUSPECT

SUBTRACT ORIGINAL FROM SUSPECT, GIVING DIFFERENCE SIGNAL OR IMAGE

STEP THROUGH ALL N RANDOM INDEPENDENT SIGNALS, MASKED AS ORIGINAL AND CROSS-CORRELATED WITH DIFFERENCE SIGNAL IN IMMEDIATE NEIGHBORHOOD OF REGISTRATION POINTS

FIND 0 AND 1 LEVEL BY AVERAGING FIRST FOUR 0101 CODE VALUES

ASSIGN EITHER A 0 OR A 1 TO EACH CROSS-CORRELATION RESULT DEPENDING ON PROXIMITY TO THE AVERAGES OF PREVIOUS STEP

CHECK RESULT AGAINST SECURED IDENTIFICATION NUMBER

PROSECUTE IF IT MATCHES? OR AT LEAST SEND A NASTY LETTER DEMANDING RECOMPENSE

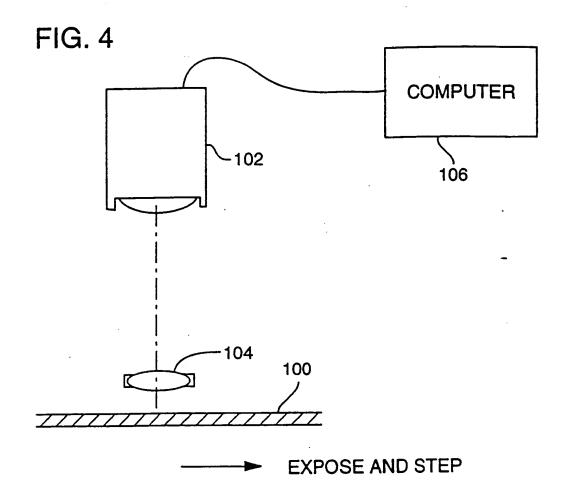


FIG. 1

DIGITAL 12

NUMBER 8 (SIGNAL LEVEL) 4

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

SAMPLE NUMBER (INDEX)

FIG. 5

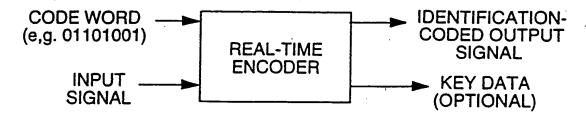
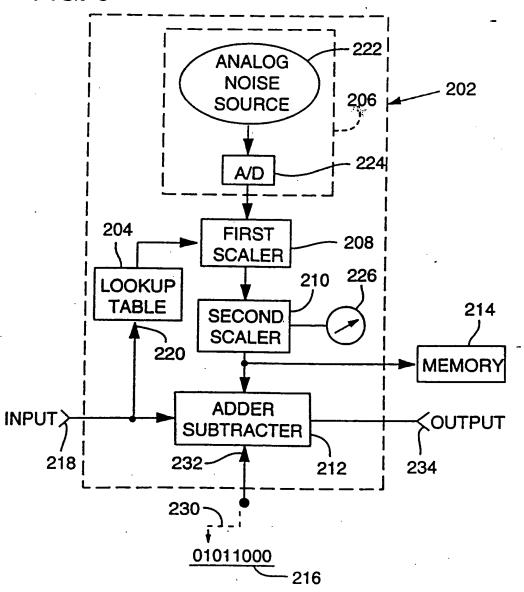


FIG. 6



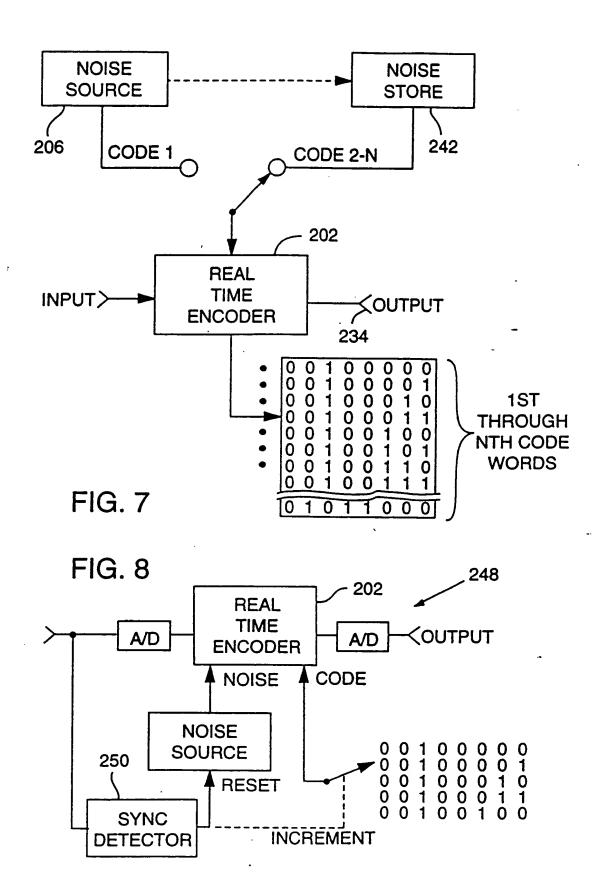
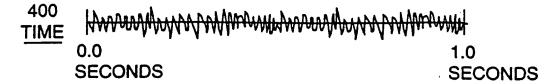
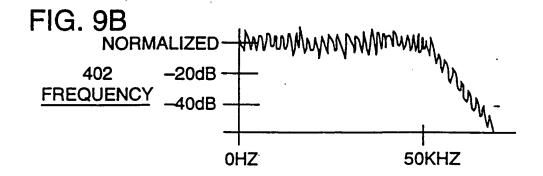


FIG. 9A





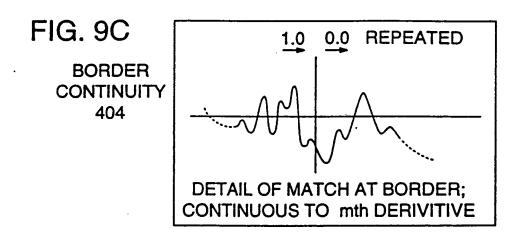
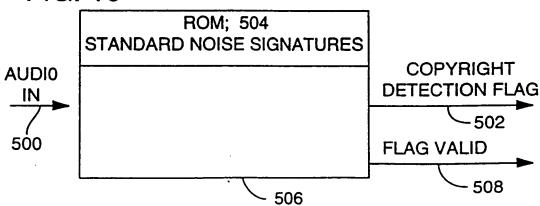
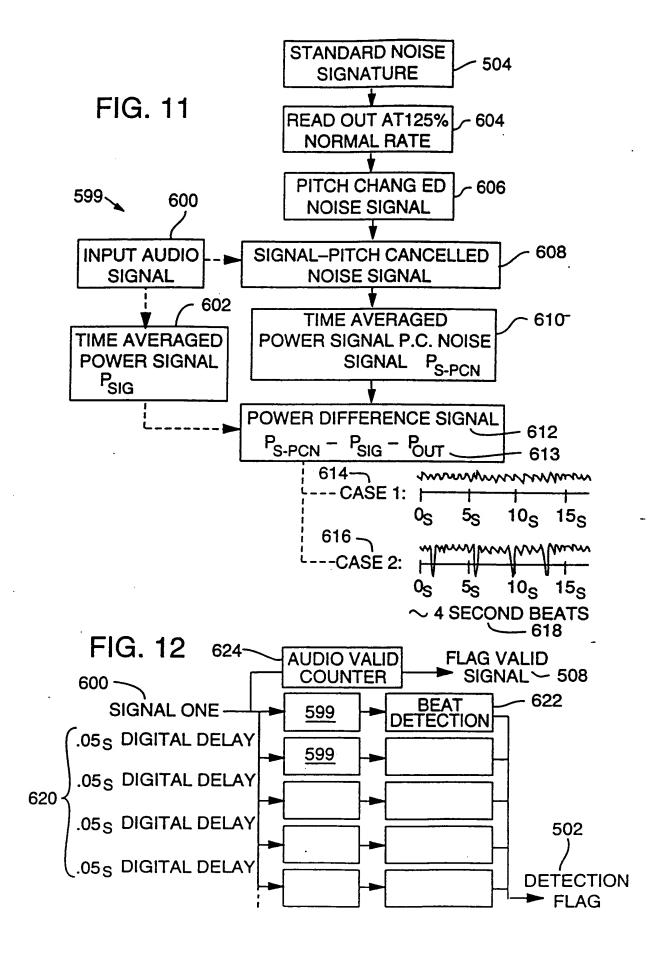


FIG. 10





Movie: Bud's Adventures

Alian Productions

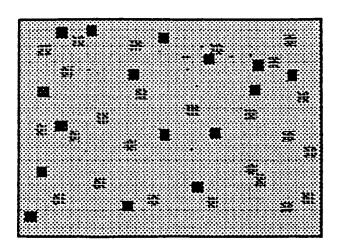
700

Frame #: 12183

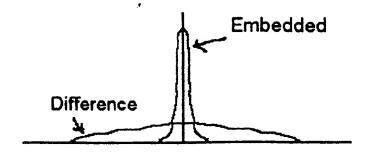
Distribution Lot: Region 14



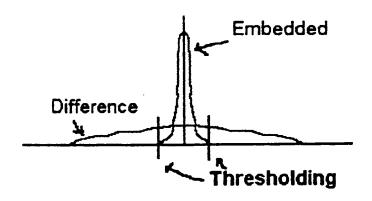
Encryption/Scrambling
Routine # 28 ,702



704 Pseudo-Random Master Snowy Image
(Scaled Down and Added to Frame 12183)

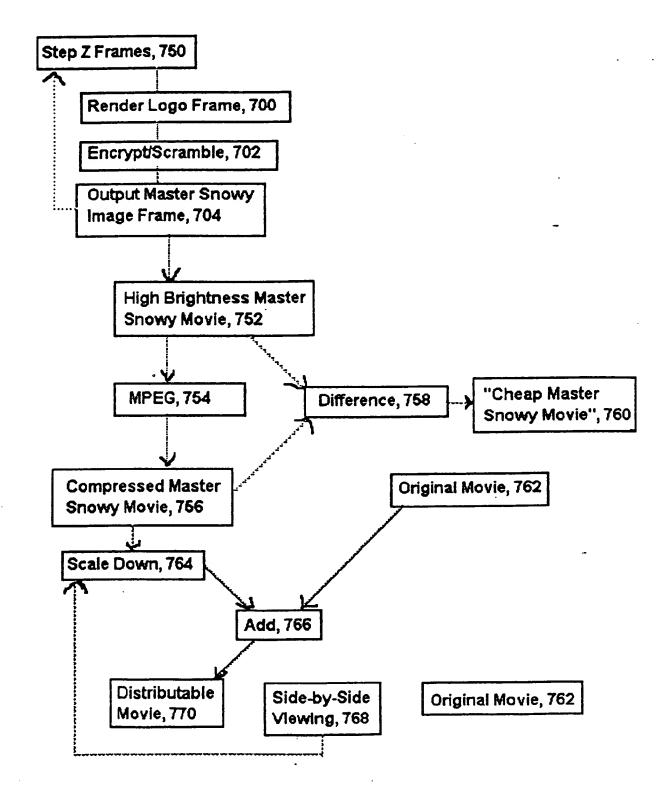


720, Mean-Removed Histograms of Difference Signal and Known Embedded Code Signal



722, Mean-Removed Histograms of First Derivatives (or scaler gradients in the case of an Image)

Figure 15



Joe's Image	001101011011101001010
	•

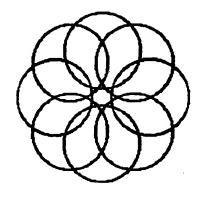
Header, 800 Data Stream, 802

Joe'e imege		Joe's Image		
	Joe's Image		Joe's Image	Joc's image
	Joe's Image	oe's Image	Joe's image	
	egemi e'sot	Joe's image	Joe's image	Joe's image
	Joe's Image	Joe's Image	Joe's Image	Joe's Image
	Joe's image	Joe's Image	Joc's image	
	Joe's Image		Joe's Image	Joe's image

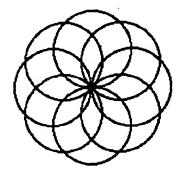
Figure 17

96 Bit Le	Leader String, 820 "Shadow Channel"		
64 Bit Length	32 Bit Data Word Size	Data	
 822	824	826	

Universal Empirical Data Format



Supra-radial Knots, 850



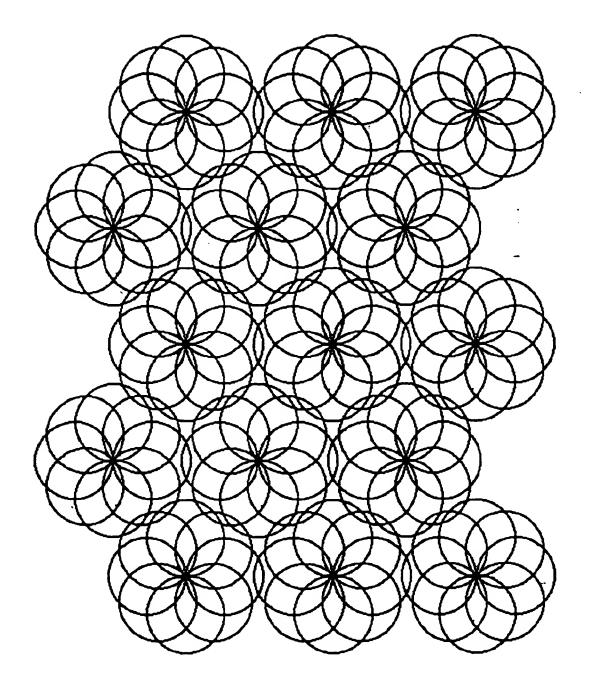
Radial Knots, 852



854, One basic concept of the knot is an overlapping of one strand of finite width over another strand

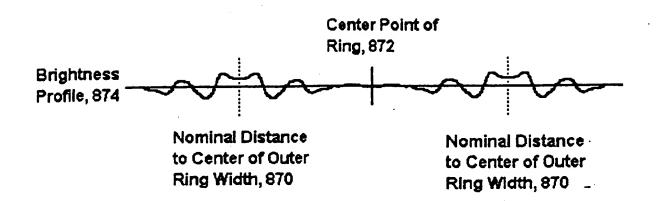


864, Another basic concept is the symetric weaving of overlaps



866, Quest for Mosalced Knot Patterns which "Cover" and are Coextensvie with Original Image;

All elemental knot patterns can convey the same information, such as a signature, or each can convey a new message in a steganographic sense



876, 2-D brightness of phase-only filtered ring is similar to the above brightness pattern rotated about central point of ring:



### Figure 21 A

С	2C	С
2C	4C	2C
С	2C	С

where C = 1 / 16

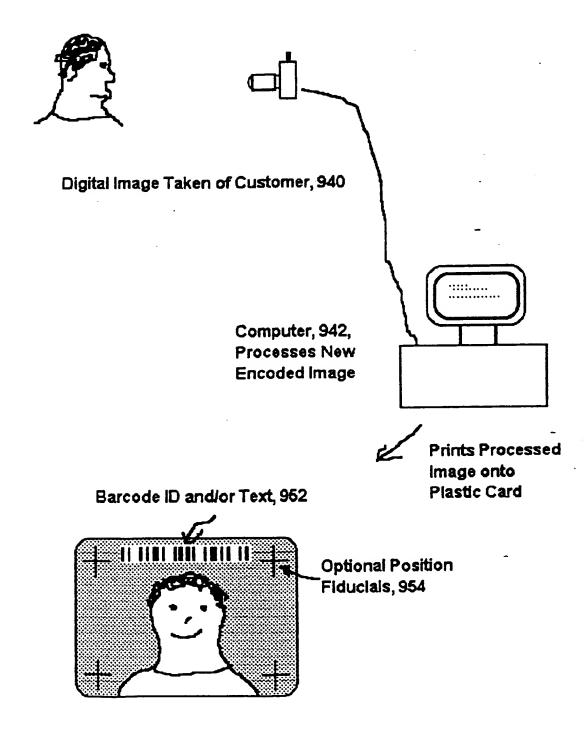
Elementary Bump, 900 (Defined grouping of pixels with weight values)

2	3	4		5		6	7	0
6	7	0		1		2	3	4
			С	2C	С			
2	3	4	2C	4C	2C	6	7	0
			С	2C	С			
6	7	0		1		2	3	4

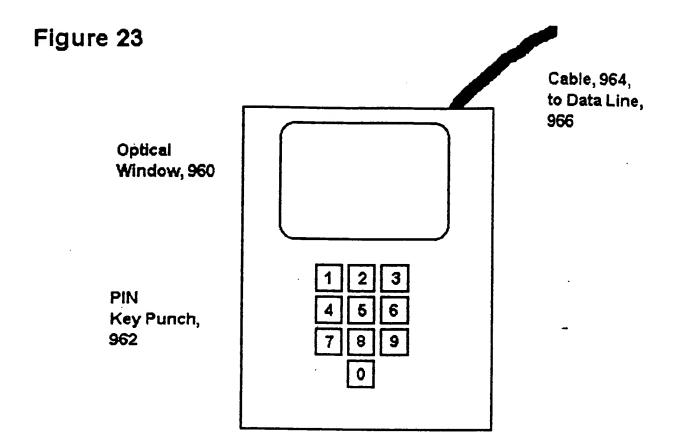
Example of how elementary bumps, 900, would be assigned locations in an image, and those locations would be associated with a corresponding bit plane in the N-bit word, here taken as N=8 with indexes of 0-7. One location, associated with bit plane "5", has the overlay of the bump profile depicted.

FIG. 21B

Figure 22



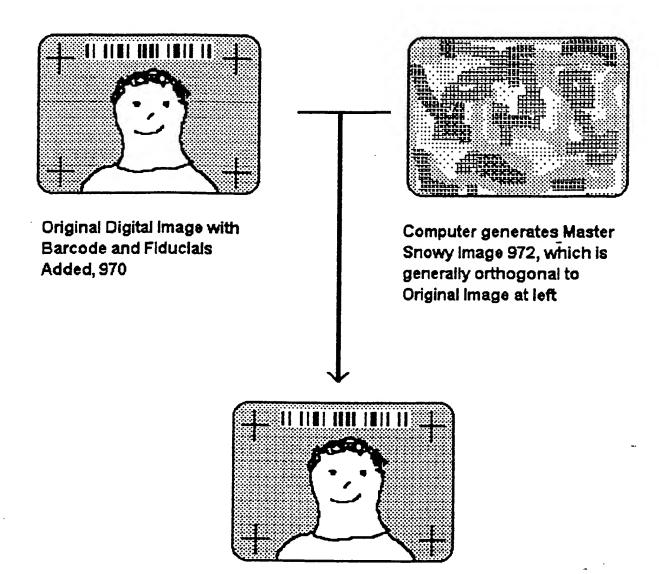
Personal Cash Card, 950



Low Cost Point-of-Sale Optical Reader, 958

Contains rudimentary optical scanner, memory buffers, communications devices, and microprocessor

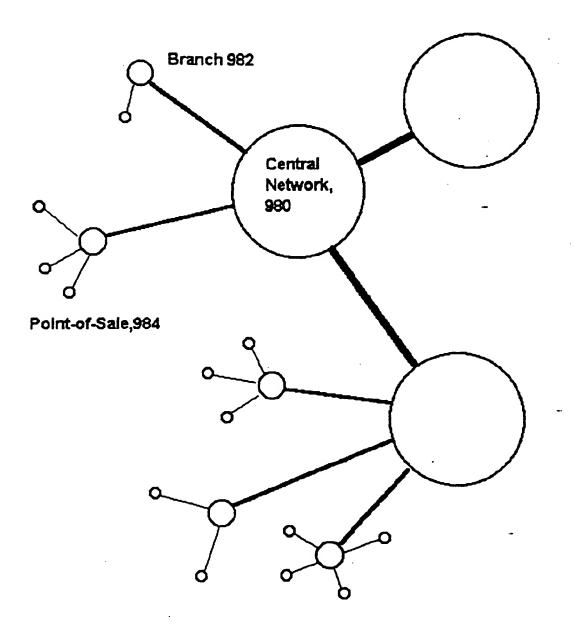
Consumer merely places card into window and can, at their pre-arranged option, either type in a Personal Identification Number (PIN, for added security) or not. The transaction is approved or disapproved within seconds.



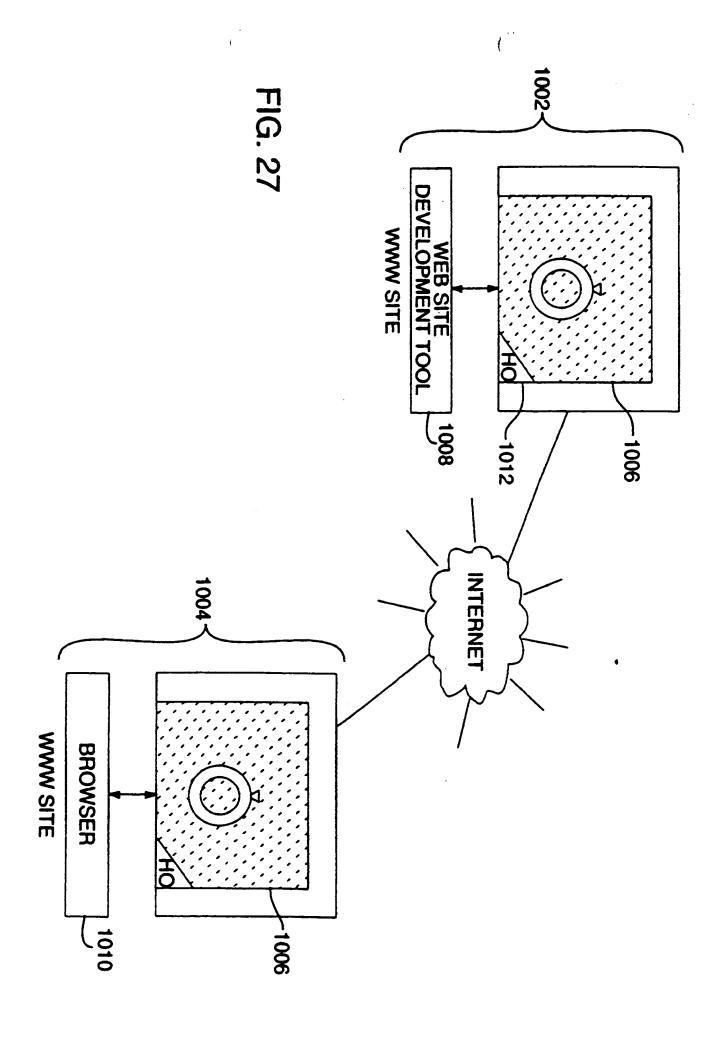
Combined to form Personal Cash Card, 950

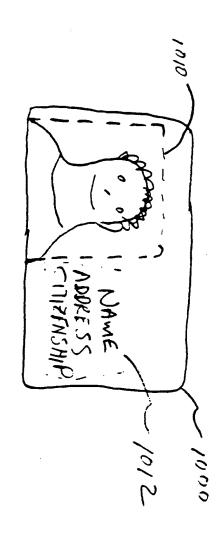
#### Typical Transaction Steps

- 1. Reader scans images on card, stores in memory, extracts persons ID
- 2. Optional: User keys in PIN number
  - 3. Reader calls central account data network, handshakes
  - 4. Reader sends ID, (PIN), merchant information, and requested transaction amount to central network
    - 5. Central Network verifies ID, PIN, Merchant info, and account balance
    - 6. If OK, Central Network generates twenty four sets of sixteen distinct random numbers, where the random numbers are indexes to a set of 64K orthogonal spatial patterns
  - 7. Central Network transmits first OK, and the sets of random numbers
- 8. Reader steps through the twenty four sets
  - 8A. Reader adds together set of orthogonal patterns
  - 8B. Reader performs dot product of resultant pattern and card scan, stores result
    - 9. Reader transmits the twenty four dot product results to Central Network
      - 10. Central Network checks results against master
    - 11. Central Network sends final approval or denial
      - 12. Central Network debits Merchant Account, credits Card account



A basic foundation of the cash card system is a 24 hour information network, where both the stations which create the physical cash cards, 950, and the point-of-sales, 984, are all hooked up to the same network conitnuously

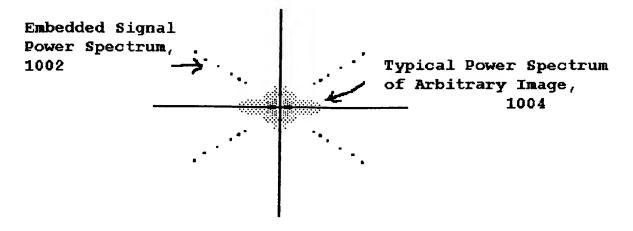




Tig. 28

(

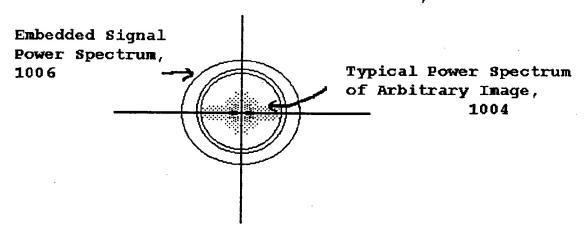
UV Plane, 1000



Non-harmonic spatial frequencies along the 45 degree axes, giving rise to a weave-like cross-hatching pattern in the spatial domain

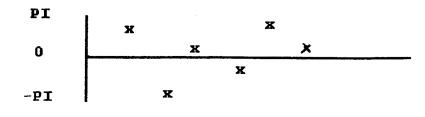
### Figure 30

UV Plane, 1000

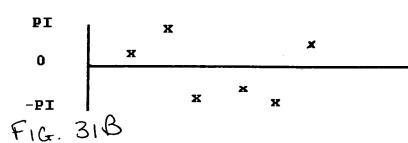


Non-harmonic concentric circles in UV plane, where phase hops quasi-randomly along each circle, giving rise to pseudo random looking patterns in the spatial domain

## Figure 31A

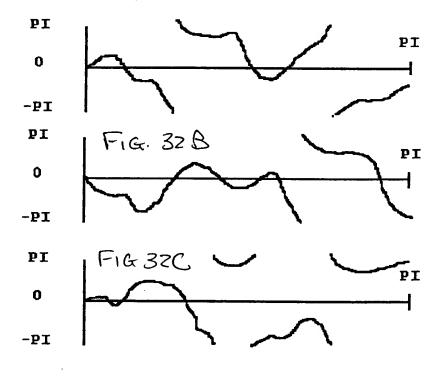


Phase of spatial frequencies along forward 45 degree axes/1008



Phase of spatial frequencies along backward 45 degree axes / 1010

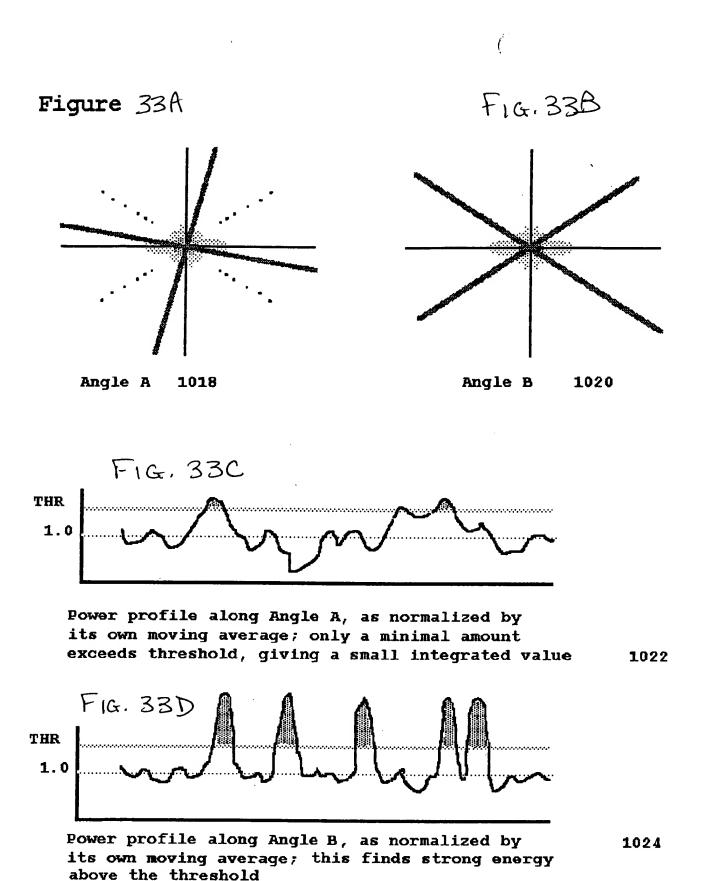
## Figure '32A



Phase of spatial frequencies along first concentric ring, 1012

Phase of spatial frequencies along second concentric ring 1014

Phase of spatial frequencies along third concentric ring, 1016



As angle is swept from

0 to 90, 45 degrees has
highest energy > threshold

degrees

45 degrees

90 degrees

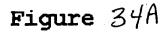
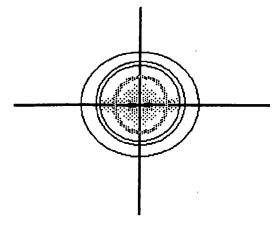
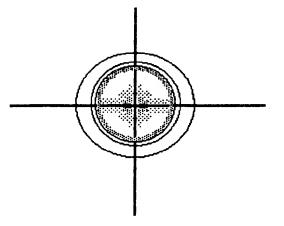


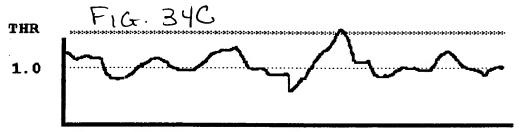
FIG. 34B



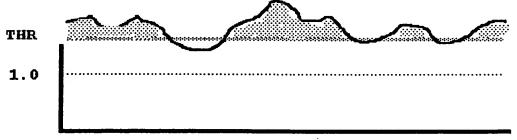


Radius A, 1028

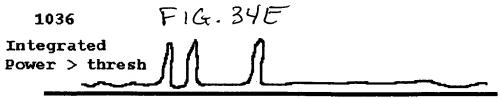
Radius B, 1030



Power profile along circle at radius A, 1032



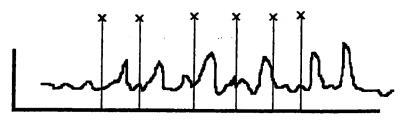
Power profile along circle at raidus B, 1034
Fig. 34D



radius, 1040

Total integrated power above threshold, as function of radius 1038

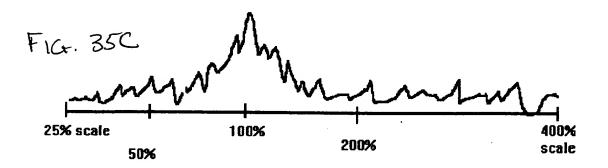
Figure 35A



Scale = A; add all power values at the "known" frequencies, 1042

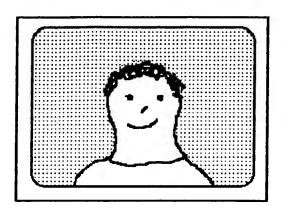


Scale = B; add all power values at the "known frequencies, 1044

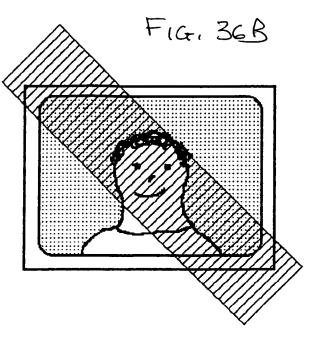


"Scaled-kernel" based matched filter; peak is where the scale of the subliminal grid was found, 1046

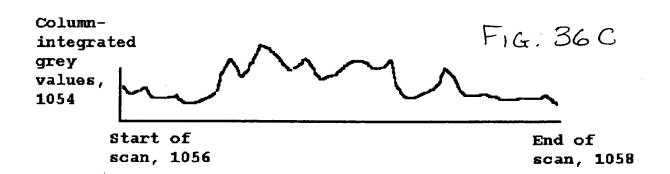
### Figure 36A

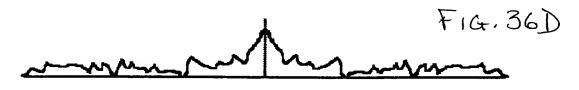


Arbitrary Original Image, 1050, in which subliminal graticules may have been placed



"Column scan", 1052 is applied along a given angle through the center of the image





Magnitude of Fourier Transform of scan data, 1060